The American Journal of Roentgenology

Edited by P. M. Hickey, M. D.
Associate Editor, F. C. Zapffe, M.D.

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THE AMERICAN JOURNAL OF ROENTGENOLOGY

Editor, P. M. Hickey, M. D., Detroit
Associate Editor, F. C. Zapffe, M. D., Chicago

VOL. I NEW SERIES, MARCH, 1914 No. 5

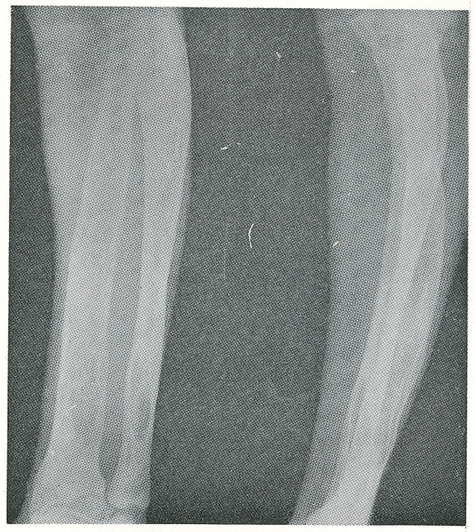
SOME UNUSUAL BONE LESIONS

By ADOLPH HARTUNG, M. D., 31 N. State St., Chicago, Ill.

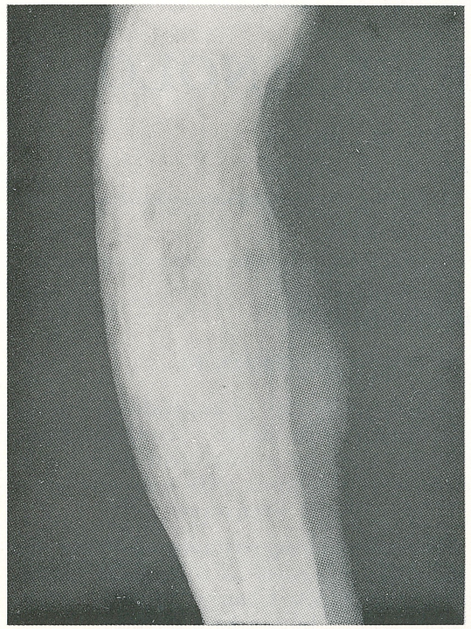
A more fitting title for my paper would probably be "Usual bone changes in unusual diseases," for I intend to present several cases for your consideration in which a more or less general involvement of the osseous system constitutes the chief claim of the condition being termed a clinical entity. I shall divide my cases into two groups —one in which the bony lesions are apparently primary and constitute the disease in toto, the other associated with some other pathologic condition which probably superinduces the bone changes.

Group 1 is represented by three cases under the general title of ostitis fibrosa; two of them are examples of ostitis fibrosa deformans, commonly known as osteitis deformans, or Paget's disease. This disease, first described by Paget in 1877, is one of the rarest of known diseases, less than 100 authentic cases having been reported in the literature to date as nearly as can be ascertained. It is characterized by a chronic inflammatory condition of the bony skeleton associated with a softening and overgrowth leading to deformities which are almost pathognomonic. Chief amongst these are the thickening of the calvarium, marked bowing of the extremities, kyphosis and apelike posture. It occurs mostly in people past middle life; its onset is insidious, course chronic and progressive with little impairment of the general health. Other pathologic processes do not accompany it with sufficient uniformity to associate any causal relationship with them. X-ray examinations have shown a coincident porosis and sclerosis of the bones with exceptionally a tendency to cyst formation.

I have had an opportunity of seeing and examining two cases of this disease in detail at the Cook County Hospital whose history and findings I here record:

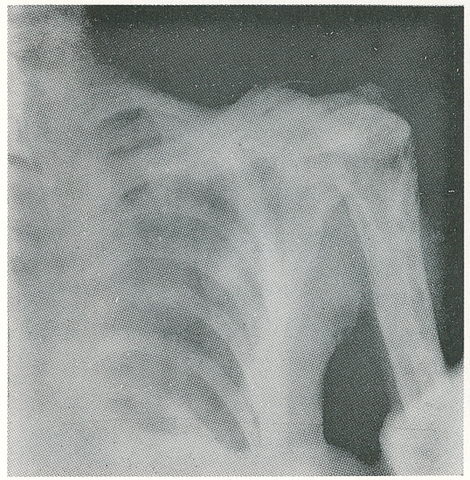


Case I. Forearm showing involvement of ulna and radius especially cyst-like formation in lower ends.

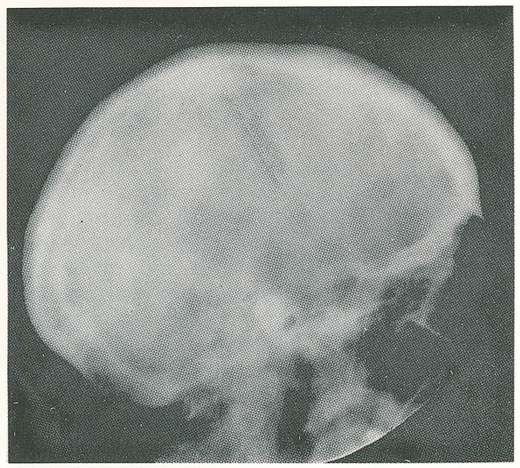


Case I. T. P. Leg showing marked involvement of tibia and fibula. Coarse trabeculation has replaced normal structure completely.

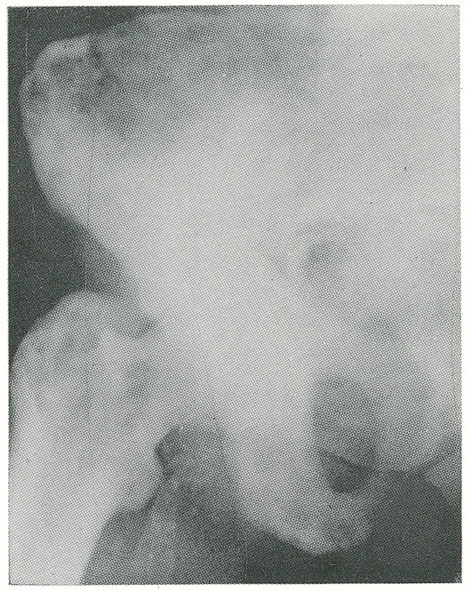
CASE I: T. P. Woman, Bohemian, 34 years old, single, waitress and domestic. Family history negative. About five years ago first noticed slight deformities of extremities which gradually increased. Sought hospital treatment for this as well as slight "sticking pains" radiating from spine, mild headaches, and easy fatigue. Physical examination showed slight emaciation, posture ape-like (patient claimed she lost 6 inches in stature). Head brachiocephalic due to smooth lateral hypertrophies of cranium. Face and neck normal. Ribs at posterior angle were unduly prominent giving spine a sunken appearance. Spine kyphotic, partially ankylosed and scoliotic in upper dorsal region. Left apex of lung involved. Had an aortic lesion. Abdomen diamond shaped, iliac crests very prominent and overlapping lower ribs. Pelvis broad and flat. Arms long, bones curved, but not enlarged. Joints normal. Femurs greatly enlarged and anteriorly curved. Hands and feet normal. Bones involved not tender to touch. Temperature, pulse, and respiration normal. Urine, sputum and faeces negative. Blood sterile. Secondary anaemia. Von Pirquet and hypodermic tuberculin test positive. No history or signs of syphilis or gonorrhea. Wasserman negative.



Case I. T. P. Shoulder region showing involvement of humerus, scapula and some of the ribs; also kyphos of upper dorsal spine.



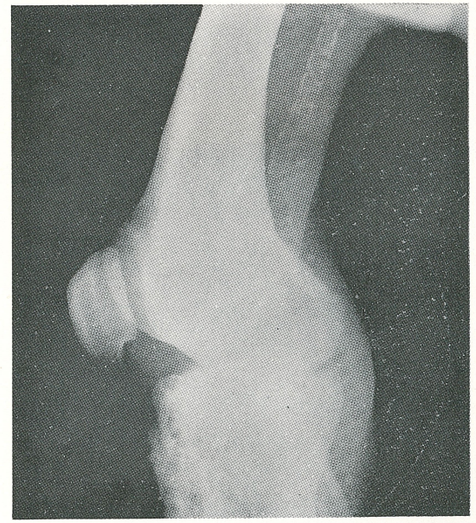
Case II. J. C. R. Head showing irregular increase in thickness of calvarium and varying consistency.



Case II. J. C. R. Hip joint region showing involvement of os inominata, femur and sacrum; also extensive arterio sclerosis.

CASE II: J. C. R. Male, American, 59, single, laborer, and peddler. Family history negative. About 9 years ago had an attack of "sciatic rheumatism" lasting about 6 months. Shortly after that noted some deformities of extremities which became progressively worse. Came to hospital because of sudden onset of ascites, cough, pain in abdomen and legs and general weakness. Physical examination showed marked emaciation, ape-like posture, claimed loss of 3 inches in stature. Head brachiocephalic. Face, neck and chest normal. Spine kyphotic and partially ankylosed. Lungs emphysematous. Left apex dull. Heart enlarged. Aortic lesion. Abdomen diamond shaped. Pelvis broad and flat. Arms long and little changed. Arteries markedly calcareous. Femurs decidedly curved forward and tibiae inward toward distal extremity. Hands and feet normal. Had ataxic motor symptoms. Temperature subnormal at times. Urine and faeces negative. Von Pirquet negative, but hypodermic tuberculin test positive and tubercle bacilli in sputum. History of gonorrhea, but not of syphilis. No signs of syphilis. Wasserman negative. Patient died about one year after entry of fibroid phthisis and exhaustion.

The X-ray examination of the above cases showed the following changes: Grossly there was marked bowing and enlargement of the long bones and hyperostosis and thickening of the flat ones. The minute changes in all the affected bones showed a coincident porosis and sclerosis, one or the other processes predominating in different parts. The fine markings ordinarily shown in the cancellous ends of the long bones were replaced by a coarse trabeculation which extended into the shafts for a variable distance —in some instances involving the entire bone. In some places the process simulated



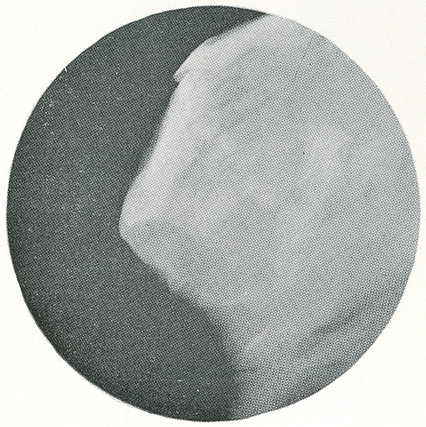
Case II. J. C. Knee showing slight involvement of lower end of femur and upper end of tibia. Note smooth articular surfaces; also calcification of arteries.

periosteal thickening, in others decalcification had progressed irregularly, giving an appearance of caries. Near the distal end of both the ulnae and radii of Case I, uniform absorption of lime salts of a limited area had occurred resembling cyst formation. In the tibiae of both cases the lumen of the medullary canal was practically obliterated, having been replaced by irregular lamellae of bone.

With the exception of the spine, the joints were not involved. The process extended throughout the epiphyses, but there was no noticeable irregularity of the joint surface. Nor was there any undue approximation of the articular surfaces suggestive of atrophy of the joint cartilage.

The spine of the man was partially ankylosed while that of the woman showed a definite angulation and loss of detail at about the third dorsal vertebra suggestive of a past or present Potts' disease.

The skulls of both patients showed well marked and similar changes. The calvarium was markedly thickened, especially at the base; an abnormal porosity in places gave a marked mottled effect to it. The sellae turcicae were found to be approximately normal.

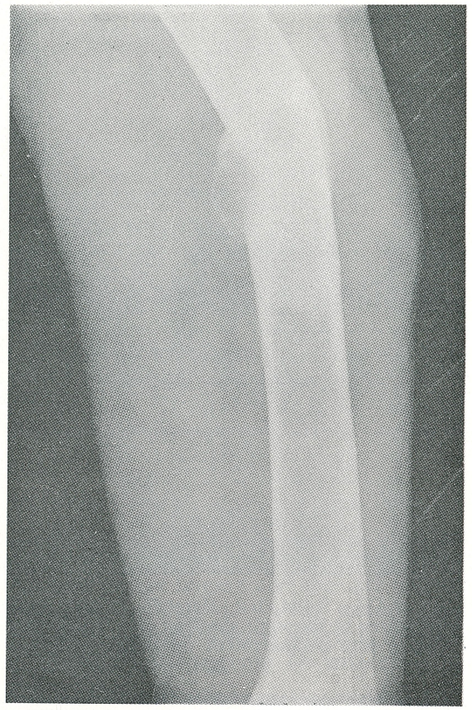


Case III. C. B. Shows cyst of the inferior maxilla near angle.

Case III. C. B. Left foot. Old cyst in fourth metatarsal bone which has become filled with calcareous deposit.

Case II showed numerous calcareous deposits in both lungs. So advanced an arterio-sclerosis was present that the large arteries could be plainly traced throughout their course in both upper and lower extremities. Although the gross changes in Case II were more marked, Case I showed a far more extensive minute involvement, including practically all of the bones except those of the hands and feet, face and a few of the ribs. In Case II the femurs were but slightly involved, and the upper extremities hardly at all except in the proximal ends of the humeri.

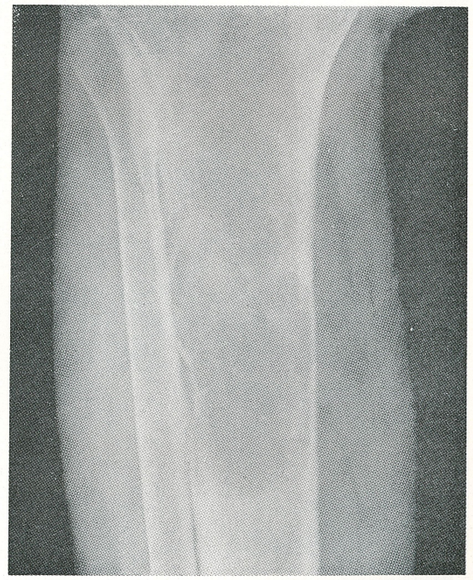
Case III comes under that type of ostitis fibrosa, first described by Von Reklinghausen in 1891. It is commonly known under the name of multiple bone cysts. Most of the cases reported have occurred in individuals under 20 years of age. Spontaneous fracture is often the first indication of the presence of the condition; occasionally the formation of a swelling with or without ac-



Case III. Cyst of humerus with spontaneous fracture.

companying pain precedes it. X-ray examination of these cases reveals an apparent localized absorption of lime salts, marked thinning of the cortex surrounding this area without evidence of associated periostitis. Often there is evidence of compartment formation and the thinned bone surrounding the cyst may be greatly ballooned out. By paracentesis a light brown fluid may be obtained containing some blood cells. The history of this case—a patient still at the Cook County Hospital is as follows:

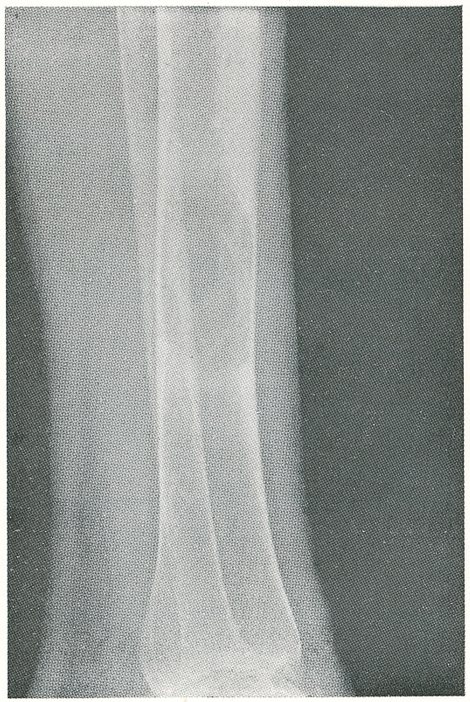
Case III: Male, Norwegian, aged 34, single, carpenter. Came to Cook County Hospital in September 1908 with diagnosis of tabes dorsalis, and an ununited fracture of left femur. About one year previous, he commenced to have pain in left leg which finally became localized about the hip. Six months later while undressing he felt a sharp pain at hip as if bone had broken. A fracture was diagnosed and he was kept in bed for 2 months after which time he got about with the aid of a cane and crutch. When he presented himself at the hospital a mass believed to be excessive callus was felt. An X-ray examination made by Dr. Potter revealed a tumor which was variously diagnosed by the clinicians as bone cyst and sarcoma. A trochar inserted met but slight resistance from the thin shell of bone and the tip seemed to move freely as if in a cavity. A straw-colored fluid was aspirated. Bone cyst was eventually fixed upon as the probable lesion. The previously made diagnosis of tabes was negatived by the exaggerated knee reflexes present and good pupillary reflexes. No specific history could be elicited and the patient's general condition was very good. Temperature, pulse and respiration were normal. Urine and blood negative. Subsequently, patient complained



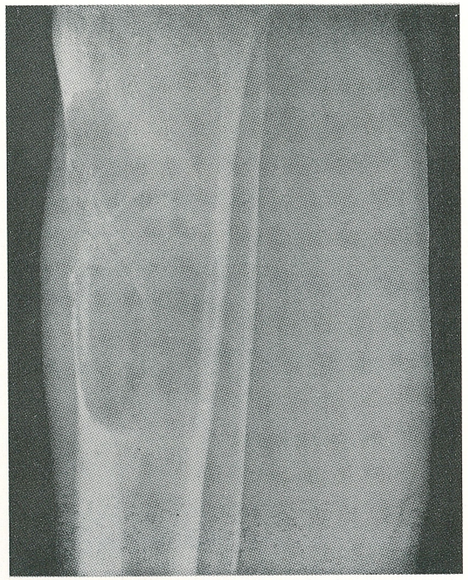
Case III. Right leg (antero-posterior).

of pain in different parts and also had several other spontaneous fractures and X-ray examination at each of these points revealed the same cystic formation.

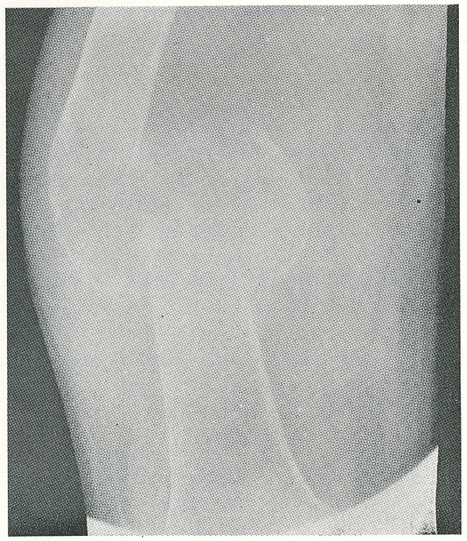
In 1912, I made a complete X-ray examination of him and found many bone cysts present which apparently were causing him no trouble. Thus, both clavicles, some of his ribs, ulna of right arm, tibia, fibula and one of metatarsals of left leg and tibia of right leg were affected. In addition to fracture near left hip, fractures had occurred in both humeri and in right femur. Most of the tumors showed a localized decalcified area divided into compartments and surrounded by a thinned and expanded shell of bone. In the right tibia a late picture shows this shell apparently broken through and the growth has all the appearance of a sarcoma



Case III. C. B. Left leg showing cyst in tibia.



Case III. Right leg (lateral) taken shortly after entry to hospital, showing cyst in upper end of tibia with compartment formation.



Case III. C. B. Right femur showing cyst formation with fracture.

from an X-ray standpoint. When I last saw him about three months ago he was apparently in good general condition and although confined to a wheel chair he assists in making bandages and dressings.

The next group of cases I wish to present belong to the general classification of hypertrophic osteo-arthropathy of Marie. His description as primarily offered in 1890 included only cases with pulmonary involvement, but other conditions have been found to induce the same changes as those upon which he lays stress. Thus in addition to pulmonary tuberculosis, bronchiectasis, pneumonia, sarcoma of lungs, empyaemia, pyonephrosis, influenza, syphilis, chronic jaundice and alcoholism may cause them. The diagnostic features of the disease are enlargement about both wrists and ankles associated with intermittent pain, rheumatic in character and tenderness to pressure. This swelling and pain may extend to other joints. The ends of the fingers and toes are usually somewhat clubshaped. X-ray examination reveals an osteo-periostitis which is believed to be either toxicogenic or infectious in origin.

Case IV: P. F., Male, Russian-Jew, aged 51, married. Tailor. In April, 1910, had some swelling about hands and feet and about 6 weeks later in both knees. Very painful and resistant to treatment. Had short periods of remission. Subsequently shoulders and other joints became involved until as patient said he had "pains all over." At about the same time, he developed difficulty in swallowing and a stenosis of the oesophagus was diagnosed. Lung findings were those of fibrous tuberculosis. Von Pirquet and Wasserman negative. Fingers and toes were clubbed, hands and feet spade-like and marked enlargement about wrists and ankles. Joints involved tender to pressure. Heart negative. Abdomen negative. Blood slight leucocytosis. Urine negative.

Case V: M. S., Female, American, aged 45, married. Had been sick 3 years. Cough, night sweats, poor appetite. Emaci-

Case IV. Hand showing osteo-periostitis along shafts of metacarpals and phalanges.

Case IV. P. F. Ankle showing osteo-periostitis along lower ends of tibia and fibula.

Case V. M. S. Hand showing osteo-periostitis along shafts of metacarpals and phalanges.

Case V. M. S. Foot showing very marked osteo-periostitis of shafts of metatarsals and phalanges.

ated. Feet and hands swell up at times and become painful. Lung findings—diffuse tuberculosis. Tubercle bacilli found in sputum. Heart and abdomen negative.

CASE VI: W. M., Male, Russian, aged 30, single, laborer. Sick about 2 years. Constantly jaundiced to a variable degree. Trouble began about 2 months after an attack of acute articular rheumatism. Jaundice first symptom. Never vomited nor had chills. Gradually lost flesh and strength. No pain in liver region. Liver enlarged to about one inch below costal arch. Margin hard and smooth. Spleen enlarged and hard. Axillary, cervical and inguinal glands slightly enlarged. Lungs negative. Valvular lesion of heart. Had been heavy whiskey drinker. No evidence nor history of syphilis. Stools clay colored. Urine bile colored. Skin itchy and lemon yellow. Blood anaemia and slight leucocytosis. Pulse and temperature normal. About one year ago feet commenced to swell up and 6 weeks ago hands likewise. Also had some swelling and pain about knees. Clinical diagnosis was probable Hanot's cirrhosis.

X-ray findings of Cases IV, V and VI showed an osteo-periostitis present in each of the cases. This was always most marked over the metacarpals and metatarsals; next in degree at the distal ends of ulnae, radii, tibiae and fibulae. A similar process was found to extend along the long bones near the other joints affected—a condition I was unable to find shown in the description of other cases recorded. The joint surfaces were not found to be involved and the clubbing at ends of fingers and toes were not due to nor accompanied by any bone changes. The physical chest findings in all three cases were verified.

My reasons for taking up these various conditions in such great detail are firstly, their comparative rarity. Secondly, to emphasize the fact that the X-ray findings in them are sufficiently uniform and characteristic to render such an examination necessary in the diagnosis of all suspected cases and last, but not least, the need for a more extensive examination in all cases where an isolated lesion resembling any of the above is found, to determine whether the process shown is not part of a general disease.

PRELIMINARY REPORT ON CONTROL OF PERCUSSION BY MEANS OF THE ROENTGEN RAYS*

By GEORGE C. SHATTUCK, M. D.,
(Assistant Physician to the Massachusetts General Hospital and Assistant in Clinical Medicine at the Harvard Medical School.)

(From the Medical Out-Patient and the Roentgenological Departments of the Massachusetts General Hospital.)

Having studied this question for a short time only, I am not prepared to add anything to existing knowledge. I desire, only, to bring out discussion, and to stimulate interest in a branch of work which seems worthy of more attention in this country, and I hope later to publish the results of my work when completed.

You are familiar with the variations in the size of the heart shadow which are referable, in individuals, to differences in body weight, stature, age, sex, occupation and position of the body. You know the three forms of heart shadow which depend chiefly on the shape of the thorax; you know the difference in position of the heart in the sexes, the shape commonly seen in old age, and the changes of position of the heart in the phases of respiration. Besides these differences, there are minor variations, not easy to define, which are comparable to individual peculiarities manifested in other parts of the body; e. g., in the face.

It has been maintained by Moritz, Dietlen, Treupel and others that outlines of the heart having a certain degree of individuality can be obtained by percussion, and that these outlines correspond fairly well with those obtained with the orthodiagraph. Dietlen and Treupel have published large series of diagrams from actual cases. Their diagrams show the outline of the heart shadow as determined by orthodiography, and also the outlines of dulness to percussion. Granted that the diagrams have been reproduced accurately and that subjective errors were suppressed as far as possible in their preparation, the following conclusions may be reached; namely, that the heart can in fact be outlined by percussion with a considerable degree of accuracy, that, not only can the three types of normal heart be recognized in this way, but that the outlines are to some degree characteristic for the individual heart.

Before discussing percussion in detail, let us consider the means and methods by which the results of percussion are to be checked. I refer to teleroentgenography and to orthodiography of which Dr. Dodd has just spoken. It is not necessary for me to compare them. Each has errors and advantages peculiar to it, and there are other errors common to both. Teleroentgenography, being more mechanical and less subjective, is likely on this account, to give the more reliable pictures. The unavoidable margin of error for either method, when skilfully used, is probably below that for the best methods of percussion. It has been stated by others that the unavoidable margin of error for percussion may be 1 cm. That for orthodiography has been variously estimated at from ½ to 2 cm., but it seems likely that, in the hands of experts, the error will seldom exceed ½ cm.

Therefore, it is right that we should control our percussion by means of the Roentgen ray, but it should be borne in mind that no method of comparative measurement of the heart has yet been devised which is truly accurate, and that the results of any method can be accepted only with reservations.

Passing now to percussion itself, let us consider some of the difficulties met with in its use. In the first place, many kinds of per-

*Read by invitation in conjunction with Dr. Dodd's paper at the meeting of the American Roentgen Ray Society, Boston, Oct. 4, 1913. Published also in the Boston Med. and Surg. Jour., V. 170, p. 190, '14.

cussion have been recommended, and the style of percussion in practice varies much among individuals. Similarly, the results of percussion, that is to say, degrees of difference of note and type of note vary with the kind of percussion, and with the method of using it of the individual percussing. It follows logically that interpretations of these differences of note will not be the same, and, in fact, disagreement among physicians about percussion outlines is so common as to excite no surprise. But, even when physicians outline the cardiac dulness quite differently, it does not follow that they will disagree as to the presence or absence of enlargement of the heart. On the contrary, I believe that men of experience generally agree substantially in a given case as to the presence or absence of definite cardiac enlargement. Slight hypertrophy of the heart, unless there is some dilatation also, cannot be demonstrated by any method of percussion owing to the wide limits of variation between the hearts of normal individuals. For the same reason, slight hypertrophy may not be demonstrable in the heart shadow, however obtained.

Treupel compared the results of three types of percussion with orthodiagraphic outlines from the same patients. He found the very light or "threshold percussion" to be rather the more accurate. He had good results also with the "touch percussion" of Ebstein and with Moritz's modification of ordinary, moderate finger percussion. The heavy type of percussion is being abandoned, and there is a growing tendency to outline both the absolute and the relative cardiac dulness rather than to be content with either alone. They are complementary when used together, and tend to correct each other. One can go a step further by marking out curves for very slight dulness, moderate dulness and absolute dulness.

We come now to what seems to me the crux of the matter. Three questions arise. First: What changes of note characterize dulness? Second: What degree of such change shall we recognize as dulness? Third: Is the dulness produced by the heart, by the varying structure of the chest wall, or by various other possible causes? We must not be led astray by differences of note other than those characteristic of dulness. We must take into account the fact that the percussion note at a given part of the chest can be influenced by accidental factors such as muscular contraction, and that such factors may produce slight dulness. We should recognize also the following facts which have impressed me more and more, but which, I think, are not always conceded; namely, that the chest of every individual has a more or less individual tone, and that it is difficult to find two areas on any chest wall where the percussion note will be the same, even though the areas chosen be side by side, or at corresponding points on opposite sides of the chest. If any of you doubt this, I hope you will test the statement yourselves in a perfectly quiet room, using a percussion stroke just strong enough to elicit audible lung resonance. The variability of note thus encountered is so confusing at times that I occasionally rely more on the degree of resistance appreciable to the pleximeter-finger than on the note itself, and I think that most practitioners use this feeling of resistance in the same way.

Here again difficulties are encountered because resistance varies with the changing width of the interspace percussed, because the costal cartilages run across the interspaces at an angle near the sternum, and because the relative resistance produced by the dome of the diaphragm or by the corresponding upper part of the liver near the base of the lung may mask the resistance due to the heart.

If all differences of note and of sensation have been correctly interpreted, and if an accurate outline of the heart has been obtained by percussion, we have reason to be pleased with our success.

If there is failure in any respect it may be found that we are trying to compare cardiac dulness too literally with a shadow produced by parallel rays, and that we have not allowed for the curve of the chest wall, which often permits dulness to appear beyond the apex of the heart. This apparent error of percussion, when it occurs, is magnified by the thickness of the chest wall when the point determined on the outside of the chest is compared with the sagittal shadow of the heart itself. The discrepancy so produced was emphasized by Moritz, and has been recognized by others. In cases where dulness reaches thus beyond the apex of the heart the error is not one of percussion but of interpretation of the findings of percussion.

I believe that those who teach percussion are in duty bound to test their methods carefully by means of X-ray examinations, that orthodiography and teleroentgenography can furnish valuable aid to the clinician, and that the advantage of using them has not received the recognition it deserves in this country.

Before finishing, I wish to express thanks to Dr. Dodd for suggesting the work, and to Dr. George Holmes for help and for taking the plates.

ROENTGENOCINEMATOGRAPHY OF THE STOMACH AND CAP

By LEWIS GREGORY COLE, M. D.
Professor of Roentgenology to Cornell University Medical College.

Numerous attempts have been made to produce Roentgenocinematographs of the stomach, as a means of recording and demonstrating the gastric motor phenomena. To Kaestle, Rieder and Rosenthal belongs the credit of first successfully reproducing on a cinematographic film a series of Roentgenograms, showing the progression of the gastric peristalsis pyloruswards. In 1909 they made 13 Roentgenograms in 22 seconds, describing their method as Bioroentgenography, and defining it as "the true cinematographic representation of the movements of an organ by means of a series of skiagrams taken during a single cycle."[1] There was some doubt as to whether these Roentgenograms, made approximately every two seconds, complied with their own definition of true Roentgenocinematography. As they repeatedly demonstrated the original film and no other, and their subsequent publications mention no further work in Bioroentgenography, it is evident that they failed to take advantage of this valuable method for practical diagnosis. In place of Bioroentgenography Kaestle has adopted the method of making 16 Roentgenograms on a single large plate, by manually moving it about.[2] This procedure affords diagnostic assistance similar to that obtained by serial Roentgenography.

The scientific value of the Bioroentgenographic record of the gastric movements was perfectly obvious. As it was impossible to obtain the apparatus used by Kaestle, Rieder and Rosenthal, or to acquire much information concerning it, the Waite and Bartlett Manufacturing Company built a machine for me, using a moving film and a single intensifying screen. This original model was demonstrated at a meeting of the American Roentgen Ray Society in October, 1910, and described 18 months later in the American Quarterly of Roentgenology.[3] While the design of this apparatus was being evolved, the author also devised and adapted to a table previously described,[4] an apparatus for allowing the rapid manual changing of 8x10 plates. A series of Roentgenograms of different phases of different cycles could thus be obtained, which when reproduced cinematographically, demonstrated the gastric motor phenomena in a graphic manner. To this procedure the term serial Roentgenography has been applied, because it is not true Roentgenocinematography. The wealth of information disclosed by a study of 650 series of Roentgenograms made by this method has been communicated in a number of publications.[5] The author has stated that from a practical diagnostic standpoint serial Roentgenography is as valuable or more valuable than true Roentgenocinematography, and requires much less elaborate

[1]Kaestle, Rieder and Rosenthal: "The Bioroentgenography of the Internal Organs." Arch. of the Roent. Ray, June, 1910. No. 119.

[2]Kaestle: "Vereinfachte Magen-Bioroentgenographie." Muenchener Medizinische Wochenschrift, Feb. 18, 1913, S. 346.

[3]Cole: "Apparatus for Moving Pictures of the Stomach." "The Gastric Motor Phenomena Demonstrated with the Projecting Kinetescope." American Quarterly of Roentgenology, March, 1912.

[4]Cole: Transactions of the American Roentgen Ray Society for 1908.

[5]Cole: "The Complex Motor Phenomena of Various Types of Unobstructed Gastric Peristalsis." Arch. of the Roent. Ray, Dec., 1911.
"A Radiographic Study of the Pylorus and Duodenum, with and without Artificial Dilatation and the Duodenum." Arch. of the Roent. Ray, April, 1912.
"Serial Radiography in the Differential Diagnosis of Carcinoma of the Stomach, Gall-Bladder Infection, and Gastric and Duodenal Ulcer." Arch. of the Roent. Ray, Oct., 1912.
"The Value of Serial Radiography in Gastro-Intestinal Diagnosis." Jour. of the Am. Med. Assn., Nov. 30, 1912.
"Physiology of the Pylorus, Pilleus Ventriculi and Duodenum as Observed Roentgenographically." Jour. of the Am. Med. Ass., Sept. 6, 1913.
"Preliminary Report on the Diagnosis of Postpyloric (Duodenal) Ulcer by Means of Serial Radiography." N. Y. Med. Jour., June 21, 1913.
"The Positive and Negative Diagnosis of Gastric Cancer by Means of Serial Roentgenography." N. Y. Med. Jour., Feb. 14, 1913.

apparatus. It is consequently a readily available and most successful diagnostic method for the Roentgenologist. From a scientific standpoint, however, it seemed worth while to perfect a Roentgenocinematographic apparatus, capable of making at least four Roentgenograms per second. This machine, which will be described in detail, is a perfection of the principle set forth in my original communication in 1910.

The process consists in moving a film of any desired length over the surface of an intensifying screen, which is rapidly excited by instantaneous flashes from a Roentgen tube. The film is propelled from one light-proof magazine into another by an adjustable mechanism.

The following is a detailed description of the apparatus built by Charles E. Dressler under the direction of the author.

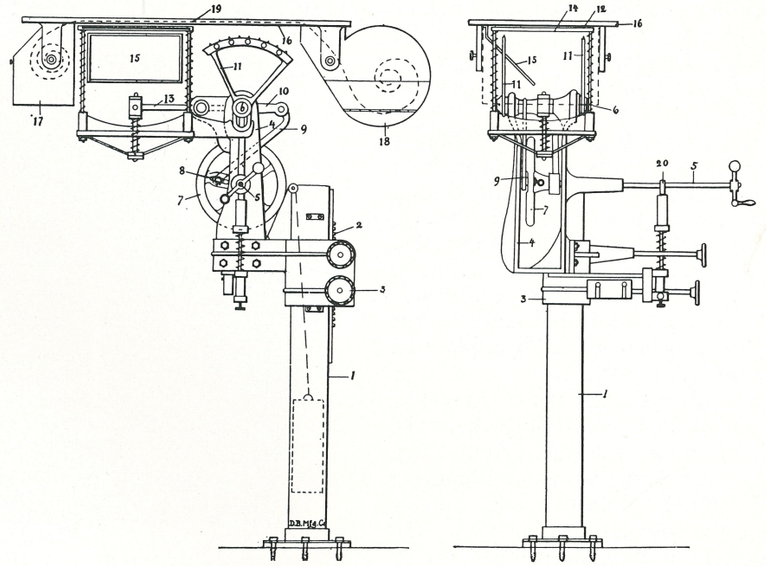


Fig. I. Drawing of Roentgenocinematographic Apparatus.

A weight, acting as a counterpoise for the mechanism, is suspended within a flanged pipe (Fig. 1) of large diameter, fastened to the floor. The mechanism may be moved up or down by rack and pinion (2), or locked at any desired point by the clamp (3) to which it is attached.

The film-shifting mechanism consists of a supporting frame (4), carrying a main or crankshaft (5), and an oscillating shaft (6) above it. Fastened to the further end of the main shaft is a flywheel (7), provided with a slot (8) for adjusting the length of film to be exposed. Next to the flywheel (7) is an eccentric, providing an up and down motion of the oscillating shaft (6), which controls the movement of the sectors (11) bearing the teeth that engage in perforation of the film. The holes of the supporting frame for the oscillating (6) shaft are oblong, allowing the shaft to move up and down. A curved lever (9) is pivoted at one end to the slot in the flywheel (7). Its other end is secured to a short arm (10) connected with the oscillating shaft, giving it a part rotary motion. The rotary motion, combined with the up and down motion, constitutes a rocking movement of the sectors (11), which propel the film forward intermittently.

Fastened to the clamp (3), which carries the film shifting device, is an arm, supporting on four spiral springs a frame, which holds the intensifying screen (12) against the surface of the film (19) during the time of exposure. Free movement of the film, when not being exposed, is obtained by depressing the frame and intensifying screen (12) by means of a lever (13) attached to an eccentric on the main shaft. Beneath the intensifying screen (12) is a fluoroscopic screen (14), face down, which enables the operator to properly center the part to be roentgenographed, and to study the parts fluoroscopically. The screen may be viewed directly or in a mirror (15), placed at an angle of 45 degrees.

Above the mechanism, and secured to the under surface of the table by sliding rails, is an iron frame (16), which carries two magazines (17 and 18). The one on the left houses the unexposed film, and the one on the right the exposed film. They are connected by a lightproof trap, through which the film is propelled by the two sectors (11).

The film (19) is 8 inches wide and of any desired length. It is perforated on both sides like an ordinary moving picture film, and begins with a blank length as a leader. In a dark room the film is threaded through the channels in the iron frame from one magazine to the other, and transported in the lightproof magazine to the operating booth, where it is slid in place on the tracks ready for use.

Near the crank on the main shaft (5) is an eccentric (20), controlling the make and break of the alternating current.

The whole apparatus is mounted under a lead lined table in a dark booth, suitable for perfect fluoroscopic examination. An extra frame, permitting the use of any of the standard cassettes for making individual Roentgenograms, gives great versatility to the machine. One can watch the gastric peristalsis fluoroscopically, and at any time when he wishes to record a series of gastric motor phenomena, he simply turns the crank, which propels the film across the screen. This is done without any jar or noise to frighten the patient, and as many Roentgenograms as one desires can be obtained. Thus satisfactory fluoroscopic observations, serial Roentgenograms, or true Roentgenocinematographs, can all be made with the same apparatus, without moving the patient. Only an instant is required to change from one procedure to another. As a result, the practical value of this method of examination for routine work, has exceeded the most sanguine anticipations.

The Coolidge tube has been of the greatest aid in sustaining a uniform penetration with a high milliamperage during the prolonged exposure necessary for recording a gastric cycle.

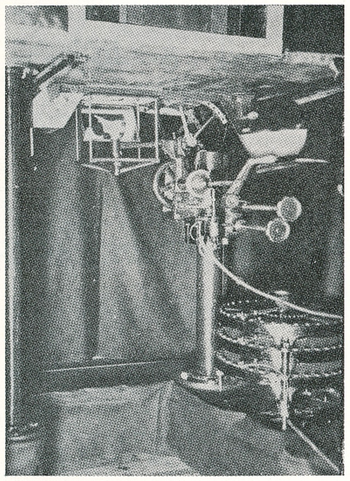


Fig. II.
Photograph of Roentgenocinematographic Apparatus.

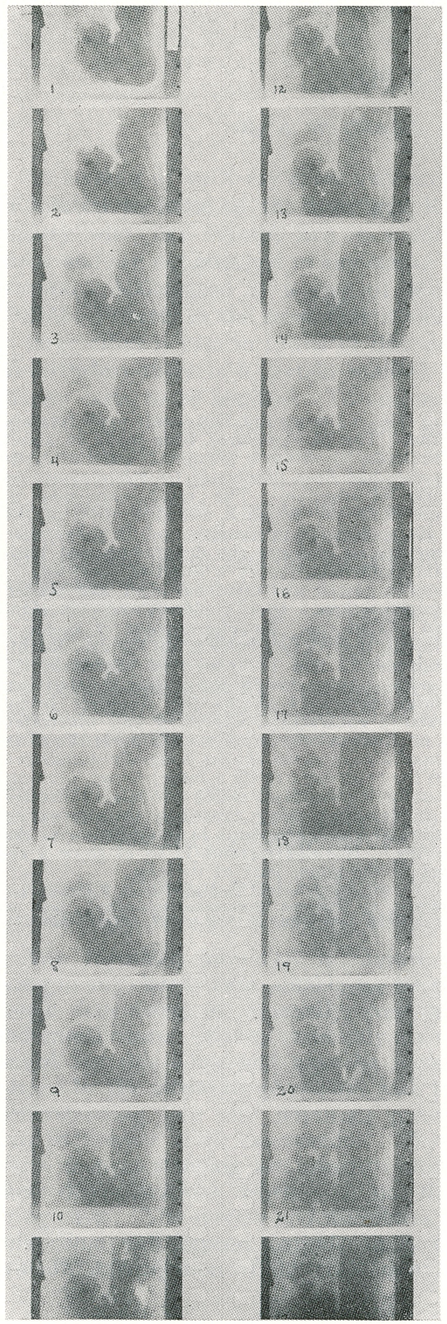


Fig. III. is the first Roentgenocinematographic film made with this apparatus. The 22 exposures were made in about 17 seconds. They show a nearly complete gastric cycle, or the formation and duration of a single antrum. The subject was one of my office assistants, a young woman free from gastric symptoms.

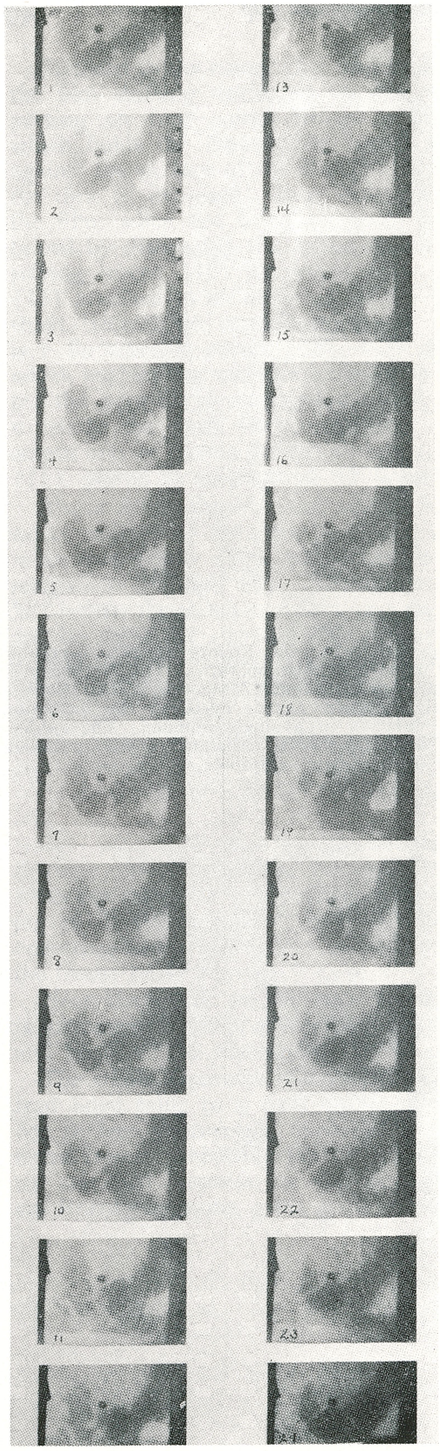


Fig. IV. is the second film, made with this apparatus. The 24 exposures were made in about 18 seconds, showing a complete gastric cycle. The case had been diagnosed by other means as pyloric obstruction. The rapid expulsion of chyme from the stomach, the distention of the cap, the unobstructed peristalsis, and the progression of the chyme through the descending and horizontal duodenum, justify a negative diagnosis of indurated gastric and duodenal ulcer and cancer. Roentgenograms 1 to 10 inclusive show an elongated dilated cap. Roentgenogram 11 shows a beginning constriction halfway up the cap. Roentgenograms 12 and 13 (combined exposure, 1½ seconds) show a contraction of this constriction. Roentgenogram 14 shows the complete broad peristaltic contraction, described and illustrated in a previous article as follows: "During the early stage of digestion the chyme is rapidly withdrawn from the reservoir cap by a rather broad, periodic peristaltic contraction, which propels it through the duodenum, possibly caused by the alternating alkaline and acid reactions in this portion of the intestine." Roentgenograms 15 to 24 show a refilling of the upper part of the cap.

Cole: "Physiology of the Pylorus, Pilleus Ventriculi and Duodenum as Observed Roentgenographically." Jour. of the Am. Med. Ass., Sept. 6, 1913, p. 763, (Figs. 7 and 10).

AN X-RAY CLINIC

By A. W. CRANE, M. D., Kalamazoo, Michigan.

An account of an X-ray clinic may prove of interest to those of the Roentgen Ray Society who, like myself, live in a small town, and are not attached to any school or hospital. Kalamazoo is a city of about 50,000. Poverty in the sense that it exists in large cities is rare in towns of this size. Nevertheless there is a certain number of charity cases to be handled. To take care of this class of cases and at the same time to demonstrate to my fellow practitioners the practicability of the X-ray examination as a clinical method, I set aside one evening a week for the examination of such cases as were brought in or sent by the attending physicians.

Dr. O. D. Hudnutt, my associate in the practice of Internal Medicine and Diagnosis, joined me in this work. The clinics have now been in operation for eight months and have met with a most gratifying coöperation on the part of the medical profession.

A copy of the circular issued to physicians explains the plan of this clinic.

X-RAY CLINIC

Tuesday Evenings from Eight to Ten

420 South Rose St., Kalamazoo, Mich.

Any reputable physician is invited to bring in any charity case suitable for fluoroscopic demonstration, especially chest and abdominal cases. Charity cases only are received for this clinic and must be accompanied by the attending physician, with the understanding that any physician present may participate in the examination. Physicians in good standing are asked to attend these demonstrations, whether or not they bring cases. The success and usefulness of this clinic will depend entirely upon the friendly participation of the profession.

It is expected that the attending physician will review the case and demonstrate the physical findings, after which the case is to be examined and discussed by the physicians present before the X-ray observations are made.

In chest cases no preliminary preparation is necessary.

In esophageal cases one ounce of bismuth subcarbonate stirred up in one-half glass of water should be given at 7:00 p. m., one hour before the X-ray examination.

In stomach cases two ounces of bismuth subcarbonate stirred well in one glassful of water should be given at 2:00 p. m., six hours before the clinic. A second bismuth mixture is also given during the X-ray examination so that the filling and movements of the stomach may be observed.

The duodenum may be observed shortly after the second bismuth meal is taken.

Portions of the jejunum may be roentgenographed, if the case requires it, within an hour after the bismuth meal.

The ileum, Lane's kink, the ileo-cecal junction, the cecum and the ascending colon are usually bismuth-coated six hours after the first bismuth meal.

In colon cases three ounces of bismuth subcarbonate stirred well in a glassful of water should be given at 8:30 a. m., twelve hours before the clinic.

For appendicial cases from 18 to 36 hours should elapse after the bismuth is taken before a plate is exposed. The patient may return the day following the clinic, or the physician may give two ounces of bismuth subcarbonate 24 hours before the clinic. This does not apply to acute appendicitis.

In rectal, sigmoid and ascending colon cases particularly, but also in some other colon cases, the barium enema is adminis-

tered at the time of the clinic so that the flow of the clyster backward through the colon to the ileo-cecal valve may be watched at intervals. A necessary preparation for the barium enema is a cathartic the night before the clinic and a soap and water enema four hours preceding.

Notification the day before of any case to be examined will be necessary in arranging the work.

No ethical objections have been encountered. Where two or more X-ray laboratories are located in the same city, a joint clinic would be a mutual advantage.

The requirement whereby a history of the case and a physical demonstration precedes the X-ray inspection, is very useful in showing that the X-ray procedure is an extension of the physical examination. The clinic thus becomes a general diagnostic clinic in which the idea is to assemble and correlate all the facts in the case. The emphasis is not always held by the X-ray. The conclusive points may lie in the physical or laboratory findings. But however clear the diagnosis may seem to be upon physical or laboratory grounds, we find few cases indeed where the screen or the plate does not amplify or correct the preceding diagnostic conceptions.

We have thus been able to extend our own experience and to demonstrate to the attending physicians both the advantages and the limitations of X-ray examinations. Although medical journals have of late published numerous articles upon the X-ray examination of the gastro-intestinal tract, yet a practical interest grows very slowly from reading alone. Actual demonstration is of incomparable value. Eight months of X-ray clinics have done more to spread the gospel of the Roentgen ray in this vicinity than my sixteen and a half years of preceding private work.*

*My first 12-inch spark Willyoung coil was installed May, 1897.

Most of the men were fairly familiar with X-ray plates and lantern slide lectures, but few or none had ever before appreciated that the open fluorescent screen is the true moving-picture screen in the realm of clinical diagnosis. The respiratory movements, the comparison of the two sides in disease, the movement of joints, the beating of the several chambers of the heart, the pulsation of an aneurism, the swallowing of the bismuth meal, the filling of a diverticulum, the demonstration of a cardiospasm, the falling of the bismuth meal into the atonic stomach, the contractions of the irritable stomach in hyperacidity, the incisura, the pylorospasm, the rapid emptying of the stomach in duodenal ulcer, the peristaltic waves of the intestines, and antiperistalsis of the bismuth enema, and the displacement and distortion of viscera under direct palpation—these, and yet more, are rendered with unimpeachable fidelity to nature, life-size, continuous and synchronous with the actual movements within the living body of the patient behind the screen.

The necessity of plates to record details too faint or small for the human eye, is soon appreciated by those attending such a clinic. The astronomer likewise uses plates to record thousands of stars too faint or too small for the most sensitive retina. Where required, plates may be developed and examined during the clinic.

Two trained nurses, Miss Bertha Woodhams and Miss Clara Griesbach, of Kalamazoo, have contributed their services in preparing women patients and giving them the support of feminine presence. They have added very much to the success of the clinic.

In the conduct of this X-ray clinic "Safety First" is subserved by the use of a minimum amperage, an aluminum filter, an adjustable diaphragm, a wooden palpater, a foot switch, lead glass and a maximum time limit. A table of original design is used, which permits of examination with the patient in either the upright or horizontal position and with the tube either above, below, or behind the patient. The screen is supported rigidly by a holder which rides in a constant relation to the tube. For the purpose of a clinic with a group of observers in the room, the upright position is preferred for obvious reasons.

In the conduct of an X-ray clinic on the lines indicated, it becomes evident that the roentgenologist needs to be a general diagnostician. However perfect the apparatus, and however clear the outlines upon the screen or plate, yet it is the interpretation of the X-ray findings that distinguishes the roentgenologist from the roentgenographer.

PREPARATION OF BARIUM SULPHATE FOR THE OPAQUE MEAL

By A. HOWARD PIRIE, M. D.

When dry barium sulphate is mixed with milk, porridge, or other food, unpleasant consequences are apt to follow, viz.:—(1) the barium does not mix perfectly with the food, (2) the chemical taste of the barium is unpleasant, (3) there is a risk of a poisonous soluble salt being present. All these three disadvantages disappear by the following procedure, which I have used at Hospital for over a year.

A brown earthenware pot, such as is used in the Pathological Department for holding specimens, and holding about a gallon, is what is used to hold the mixture. Into this pot is put Merck's Barium Sulphate pure, (about fifteen cents a pound) so as to make it a quarter full. Very hot water from the tap is then run into the pot till it is nearly filled, the mixture is then stirred with a piece of stick (of about the thickness of a broom-handle), until on lifting out this stick, no barium mud adheres to it. The mixture is then like rich milk, and it is allowed to settle. After one hour sufficient settling has taken place, and the bulk of the water is poured off. The pot is filled up at once, stirred, and after an hour or two the water is again poured off. This is done three times, and the mixture is then allowed to settle over night. In the morning the water is carefully poured off, and thick barium sulphate mud remains in the pot. This mud is very fine on the top layer, growing coarser deeper down, and the bottom layer consists of grit.

For use, the surface mud is skimmed off and placed in a tumbler till sufficient for the opaque meal has been collected. One third of barium mud to two thirds of buttermilk is about my usual proportion. I go on using the top layer of the barium mud during the day, and then at the end of the day the pot is filled up with hot water, stirred till the mixture is like rich milk, and allowed to settle till next morning, when the water is poured off and the mud is ready for use once more. It is better to refresh the mixture by daily washing, as it gets stale if it is allowed to go several days without washing. If any milk or other food is added to it, it would smell badly in a day or two. Care must be taken to use a clean spoon for scooping out the mud. I use a small ladle for the purpose, and always leave it in the pot. If the spoon has been put into the meal and then into the barium mud, the latter would after a day or two be offensive, unless daily washing of the barium were carried out.

The daily settling ensures the presence of the finest sediment on the top. When the supply in the pot begins to get low, one is apt to get grit mixed with the meal. The mixture should be then set aside, and the pot washed out, and the process started over again.

The barium which has been set aside can be used for an opaque enema. The grit is nothing more than small unwetted particles of barium sulphate which stick together, and can easily be separated by rubbing, and therefore this grit is not harmful as an enema.

The daily filling, stirring, and emptying of the pot can be carried out by a laboratory assistant in about two minutes.

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EDITORIAL

A mid-winter meeting of the Western Section of the American Roentgen Ray Society was held at Detroit, Feb. 21st, 1914, at the Hotel Cadillac. The attendance was very good, and great interest was manifested in the program. In the morning, Dr. Rollin Stevens gave a demonstration of the newer methods of measuring the Roentgen dose for treatment; Dr. Hickey gave a demonstration of stereoscopic work on head and spine and Dr. J. T. Case gave a demonstration of the Coolidge tube. In the afternoon, a lantern slide program was provided in which a large number of very interesting and excellent slides were shown. The discussion was spirited although informal and there resulted in bringing out a number of very interesting points. Owing to the large number of slides shown, an evening session was necessary to complete the program. A number of the slides shown with their clinical histories will appear in the future numbers of the Journal.

As the time approaches for the next meeting of the American Medical Association to be held at Atlantic City, consideration should be given for the securing of a proper exhibit of Roentgenograms. Inasmuch as Roentgenology interests so many members of the medical profession and extends its aid to so many practicing the different specialties, it would seem proper that this exhibit should be given a more prominent place than has been accorded in the past. When the Association met at Atlantic City two years ago, the space for Roentgen plates was confined to an out-of-the-way gallery with absolutely no conveniences provided for those who might desire to exhibit. At the last meeting held at Minneapolis, the exhibit was placed upon the top floor of the scientific building and it required a maximum of enthusiasm to climb the long flights of stairs. It would be a wise plan if one member on the committee of scientific exhibits would be a man interested in Roentgenology and who would see that better accommodations were provided. Furthermore, if a concerted plan could be arranged between the committee of scientific exhibit of the American Medical Association and the exhibit committee of the American Roentgen Ray Society, there could be arranged an exhibit which would be of high educational value. While perhaps the practice of giving an award to those presenting the best individual collection may have certain features to commend it, it practically results in the glorification of the individual who can get together the largest number of the most striking slides. The competitive blue ribbon methods moreover lose sight of the real educational value of scientific exhibits, and should be replaced by broader and better plans by the committee.

We have been asked to publish the following, and we take pleasure in complying. —[Ed.]

THE ROENTGEN SOCIETY
AT THE
INSTITUTE OF ELECTRICAL ENGINEERS.

February 16th, 1914.

Dear Sir:

A Sub-Committee of the Roentgen Society is at present considering the question of the measurement of X-Rays in connection with therapeutic practice.

They would be grateful for any help which you can contribute, and with this object in view, I am authorized to send you the accompanying circular, containing questions which indicate the nature of the information which they think may be of use.

It is unnecessary to say that any information you may give will, if desired, be treated entirely as confidential.

It is the intention of the Committee ultimately to draw up a report which will be published.

I am, yours truly,

ROBERT KNOX, M. D.,
Hon. Secretary.

Please reply to the Hon. Secretary,
7 Harley Street, W., London, Eng.
[P. T. O.

Questions.

(1) What types of Rays do you employ? (Soft—Medium—Hard)—and for what purpose?
(2) What methods do you employ for measuring
  (a) Surface Irradiation,
  (b) Deep Irradiation?
(3) Are you satisfied with the present methods; if not, in what respect are they faulty?
(4) What data do you consider essential in order that the dosage may be more effectively standardized than hitherto?
(5) Can you make any suggestions as to improvements upon existing methods of measurement, either of Hardness or Intensity?

We are in receipt of a communication from Dr. Wm. James Morton, 18 28th St., New York City, calling our attention to the VII International Congress of Electrology and Medical Radiology which will be held at Lyons from the 27th to the 31st of July, 1914. From the synopsis of the program which is available at present, it would appear that the meeting will present many interesting features. There will be a paper by Dr. Albers Schoenberg, of Hamburg, on Means of Protection of the Operator Against the Ray. Further particulars concerning the Congress can be obtained from Dr. Morton.

THE PHILADELPHIA ROENTGEN RAY SOCIETY

This Society was first organized in 1905 and, during the eight years following, owed much of its success and enthusiasm to the efforts of Dr. Leonard as permanent secretary. In fact the promotion of good fellowship was, during this period, the principal object.

Believing that the time had arrived for adding to this very worthy object some definite scientific work as well, a new constitution and by-laws were adopted December 1, 1913. Dr. Geo. E. Pfahler was elected President, Dr. Henry K. Pancoast, Vice-President and Dr. David R. Bowen, Secretary-Treasurer. Meetings are held monthly at the various hospital and private laboratories. The first hour is given to the exhibition and criticism of plates. Later abstracts of journals are read, the various journals being permanently assigned to the members. The abstracts are discussed and this part of the program is really a study of current roentgen literature.

A simple lunch is served by the host of the evening. This season the Society has been also fortunate in unexpected additions to the program. In January there was a discussion of the Coolidge tube by Dr. Edwards, Dr. Manges, and Mr. Snook. In February Dr. Boggs gave us an optimistic outlook for roentgen therapy. In March Dr. Lillienfeld of Leipsic described new types of tubes including his own design.

At the invitation of the New York Roentgen Society, a joint meeting was held at the Waldorf-Astoria February 28th.

The feature of that meeting was a comprehensive description by Dr. Samuel Stern, of the deep therapy method as used at Freiberg and modifications as seen at other European clinics.

The Society will sponsor an attempt to meet the demand for post graduate instruction in roentgenology by a four weeks course to be given, first, in May of this year, with Drs. Pfahler, Pancoast, Manges, Newcomet, and Bowen as instructors.

Work will be given at the University, Philadelphia (Blockley), Presbyterian, Oncologic, Jefferson, Medico-Chirurgical, and Pennsylvania hospitals; the object being to occupy the student's whole time during the four weeks.

OBITUARY

HENRY GREEN
1860—1914

Henry Green, who died at Hartford, Connecticut, on March 4, 1914, did more for the advancement of X-ray tubes than any one man engaged in their manufacture. He produced the first X-ray tube in this country, using a concave cathode to focus the cathode stream. This was a vast improvement over the crudeness of the Crooke tube, in which the cathode was a flat disc and the anode the glass wall.

Within two weeks after the announcement of Prof. Roentgen's discovery, Mr. Green became interested in X-ray tubes and immediately began experimenting and like other pioneers, not realizing the danger, used the rays without protection. He was engaged in the manufacture of incandescent lamps at this time and had glass blowers and vacuum pumps to aid him in his experiments.

In 1896 he produced the first tube of importance. This was the Monell type and was used mostly for static machines and light induction coils. He soon realized the importance of devising a means for the control of the vacuum in X-ray tubes to produce rays of different penetrative power and being of an inventive turn of mind, made a regulator which consisted of ordinary cotton and salt. This he attached to the bulb of the tube and so produced the first automatic regulating X-ray tube.

True to his nature, Mr. Green always kept abreast of progress in his line and improved his tubes each time the electrical apparatus showed improvement. When the induction coil showed that it was to play an important role in the science, Mr. Green was right at the front with a tube exhausted in such a manner that it was of inestimable value to the men working in this line. As the coils were built heavier, he realized that the anode of the time was not suitable as it could not stand the heavy current and devised a method of uniting two such metals as copper and platinum, which were ideal for the work demanded. Among the other improvements due to his untiring efforts was the hollow cathode which added greatly to the efficiency of X-ray tubes and helped to produce a large volume of rays.

Mr. Green was granted a number of patents for the improvements he created and all these were embodied in his tubes, which were of great assistance to the medical profession, making it possible for them to delve deeper into the mysteries of X-rays and so extend their scope for assistance to humanity. The last improvement that Mr. Green patented

and added to his tubes was the changing of the shape of the cathode and so making it possible to pass heavy currents through the tube for short exposures without destruction to the tube itself.

For years Mr. Green did his work handicapped by almost total blindness, having lost the sight of one eye when a young man and later suffered from a cataract on the other.

Born in Birmingham, England, fifty-four years ago, he came to this country when a young man and settled in Canada, following his trade as a mechanic. In 1888 he came to Hartford, engaging in the incandescent lamp manufacture until 1900, when he confined himself entirely to the X-ray tube business.

Mr. Green's death was due directly to a malignant cancer of the liver produced by exposure to the ray. His first trouble was noticed in 1905, when his left hand showed that it had become badly burned from his constant use of it for experiments. Next a superficial cancer broke out on his forehead and he was operated on for removal of these two growths, it being necessary to skin-graft both hand and forehead.

His burns did not bother him again until 1912, when a fibrous sarcoma appeared on the lower lip. In 1913 he underwent four serious operations for the removal of cancerous growths on his face. The last operation was in November of last year, when his left thumb was amputated and glands in his chest and arm removed in the vain hope of saving his life.

The X-ray profession has not only lost a pioneer, but a good friend, who was liked by all who knew him. He was of a genial disposition, an optimist and one who never lost his courage or his ability to enjoy a good story even to the very end. About two years ago he began to break down under the continued suffering and accordingly made arrangements to retire gradually from business and leave the responsibility to others associated with him. He had practically retired and was hoping to enjoy the fruits of his years of hard labor when death came.

ABSTRACTS

A critical study of intestinal stasis including new X-ray observations and conclusions respecting the cause of ileal statis.* By James T. Case, M. D., Battle Creek, Mich.

While doubting the advisability of many of the radical operations for the relief of constipation, especially those based upon the presence of ileal kinks, Dr. Case urges the importance of recognizing the danger of continued intestinal stasis and of relieving it. So-called Lane's kinks and other adhesions of the terminal ileum are recognized as occasional causes of ileal stasis. In the majority of Lane's kinks found in the surgical clinic of Dr. J. H. Kellogg, at the Battle Creek Sanitarium, there has been no obstruction discernible, and the kinks have been conceded to be of secondary importance.

A spasm of the ileocecal sphincteric mechanism is also recognized as a probable cause of ileal stasis, spasm of this sphincter being analogous to spasm of the pyloric, cardiac and anal sphincter, and probably due to similar causes.

In the essayist's opinion, the majority of cases of ileal stasis are due, not to Lane's kink, even though it may be present, but to a new and additional cause of ileal stasis, viz., incompetence of the ileocecal valve. More than five hundred cases of ileocecal valve incompetency have been studied and in practically every case there have been all the clinical evidences of alimentary toxemia. Ileocecal valve incompetency has been proven, not only by the passage of a bismuth enema through the ileocecal valve into the ileum, but also by the observation made in more than fifty cases where ingested food regurgitated from the cecum into the ileum.

Still further evidence of the importance of the normal competence of the ileocecal valve is afforded by operative findings. In nearly one hundred cases operated on by J. H. Kellogg for repair of the ileocecal valve, post-operative studies have shown a very marked diminution of the ileal stasis, with reduction, and in most cases complete disappearance of the clinical evidences of stasis.

The splendid results which have been accomplished in certain extreme cases by radical surgical treatment, such as short-circuiting with or without removal of the colon, are noted, but the essayist takes a stand in opposition towards the tendency to radical operative interference for the relief of intestinal stasis. Short-circuiting and colectomizing operations are hazardous. Appendicostomy has been unsatisfactory. The colon is more of a misused than a useless structure. Non-surgical treatment, especially dietetic, should be given thorough trial.

The essayist believes it reasonably proven that incompetence of the ileocecal valve does account for the ileal stasis in a considerable proportion of cases of intestinal toxemia, including many cases of well-developed Lane's kinks; and hence, if any operative procedure at all is indicated, a simple operation for repair of the incompetent valve, such as the one published by Kellogg, is sufficient, except in very rare cases. Thus far this operation has usually been performed in connection with some other surgical procedure which required opening the abdominal cavity.

*Read before the New York Academy of Medicine, January 15th, 1914.

Kienboeck, R.: The dosage of Roentgen Rays (Zur Dosierung der Roentgenstrahlen). Muench. med. Wchnschr., 1914, LXI, 74-75.

In answer to a discussion at the session of the Berliner medizinische Gesellschaft, Dec. 4th, 1913, where several speakers said that the method of measuring with the quantimeter was not reliable and some went as far as to say that the entire dosaging was a matter of sensitiveness, Kienboeck says that just on the contrary the measuring of dosage with the quantimeter was an exceedingly reliable procedure if all prescriptions are observed.

Above all he emphasizes that the original test strips should be used; they are manufactured by Reiniger, Gebbert and Schall in Berlin-Erlangen. Important prescriptions are above all the composition of the developer, the temperature of the developer, the time of developing, the manner of drying and the reading of the scala. To neglect one of these prescriptions means errors. Every package of these reagenz strips contains a prescription which says how the developer must be composed and how long the development must last. During the development the vessel for developing must not be held with the hands, because the heat proceeding from the hand increases the temperature of the developer and causes errors in the reading of the scala. The reagenz strips must be vertically dipped into the fluid and constantly, but not too fast, be moved around. The attention must be directed to the watch. One and the same developer should not be used for too many strips and should not be left standing open. The solution of the developer may be used for new strips after a few hours but should not be left open over night and then be used again because it loses much strength by access of air. When taking the strips out of the package care must be taken not to soil them in any way, touch them with wet fingers or place them on a wet place because this would injure the sensitive layer. All vessels and clamps should be carefully cleaned before they are used for the development. After being watered the strips must not be dried in warm temperature, because then they would get a darker stain. In reading the doses from the scala the determination of the degree of staining must be done with great accuracy. The illumination has to be correspondingly good. The scala and the strip must lie on the same level. A small space may be left between scala and the strip, which will make the difference in the stain easier distinguished. Mistakes may happen unnoticed but they do no harm when the incandescent light control procedure is used. This control gives a document for the dose which can be used with accuracy.

With medium soft light a 1 mm. thick plate of aluminium absorbs as much roentgen ray as a muscle parenchym layer of 1 cm. thickness. Other doses in the depth can be measured in the same way.

A specially accurate and direct method of measuring the rays is the placing of a quantimeter test strip in a cavity of the body or placing a strip under the irradiated part of the body:

To verify larger doses with the quantimeter, it is best to change the test strips repeatedly during the therapeutic sitting.

If various tubes are to be compared with one another this must be done on the same manikin.

The careful and accurate use of the quantimeter in the hands of skilled men has proved its reliability.

Japiot, P.: Fracture of the tuberosities complicating luxation of the shoulder (Fractures des tuberosites complicant la luxation de l'epaule valeur diagnostique de la radiographie). Arch. d'electricite med., 1914, XX, 5-13.

Of several cases of luxation of the shoulder where complications were suspected, roentgenography revealed fracture of the tuberosity in four cases.

In the first case a pile of wood fell upon a man's shoulder, and threw him to the ground. The doctor whom he saw diagnosed luxation of the shoulder which he reduced without difficulty. Some months later the patient complained of muscular atrophy and limited abduction, and a roentgenogram which was then taken showed a fragment of the tuberosity detached and slightly displaced upwards to the acromium.

In the second case there was after a fall upon the shoulder some difficulty in the reduction caused suspicion of a fracture of the head, and roentgen cliche showed

besides the luxation a small osseous fragment belonging to the tuberosity, separated a finger's breadth from the head opposite the inferior border of the glenoid cavity. A second picture was taken after the replacement, and this showed the fragment in its place, fitting exactly to the head.

The fourth patient had been waiting a month before he went to the hospital; the luxation is here interesting because it is sub-glenoid, the arm is in abduction at a right angle to the thorax, and it is rather admirable that the patient could stand this position for such a long time. The fractured tuberosity is driven upwards by the head, the latter being fixed below the glenoid cavity, the border of which appears fixed in the hole of the fracture.

The cases show the great diagnostic value of roentgenography. The fracture of the tuberosity is considered a frequent complication of luxation of the humerus; the reported series of a small number of cases is exceptional; other cases pass perhaps unnoticed, because the roentgenographic research is not carefully and systematically done. In old cases it will be often difficult to reveal the origin of the scapulo-humeral periarthritis without roentgenogram and in recent cases the latter constitutes always a useful precaution: it allows the fracture to be placed in evidence and to foresee the consequences of this lesion.

Bittrolff, R.: Roentgentherapy for tuberculosis of the ribs and the sternum (Die Behandlung der Rippen- und Brustbeintuberkulose mit Roentgenstrahlen). Muench. med. Wchnschr., 1914, LXI, 357-359.

From October, 1910, to April, 1913, thirty cases of tuberculosis of the ribs and the sternum were treated at the chirurgische Universitaets klinik at Heidelberg. Nine of these cases cannot be considered because the patients could not be found later for examination, which leaves twenty-one. In ten cases the ribs were resected, in ten the operative procedure was confined to puncture of cold abscesses or excochleation of the diseased focus, and in one case the therapy consisted in roentgenization alone. The other cases were also roentgenized except one of caries of the fifth rib where a cold abscess was incised after which a fistula persisted. Four cases were also treated with old tuberculin.

The irradiations were performed at intervals of 3-4 weeks, and continued as long as possible. A 30 cm. spark inductor with quicksilver interruptor was used. 1-2 mm. ampere; aluminum filter 1.0-1.5 mm. The diseased parts were irradiated from various portions of the skin, and ½ to 1 dose of Saboraud given, an effect which can be obtained in 15-30 minutes according to the density of the focus.

Considering the results we can say that in four of the twenty-one the disease had spread further; twelve patients may be considered cured, as they extended one to three years back and a relapse is not likely; in two cases an improvement is very probable and in three cases there was a considerable improvement effected. The cases were all severe.

In conclusion the following therapy is recommended: Resection of the diseased parts, curettage of the tuberculous proliferations with a sharp spoon; puncture of the cold abscesses with the above indicated roentgenization following.

A combination with tuberculin therapy was employed in six cases and may have good results. General therapy for tuberculosis should never be omitted.

The roentgenization never had any bad secondary after effects; in six cases which had been irradiated very frequently the skin had become atrophied and permeated with more or less numerous fine teleangyectasies. In one patient the black hair on the chest fell out and white hair grew later in its place.

Monheim: Roentgentherapy for myomata and fibrosis uteri (Die Roentgenbehandlung der Myoma und Fibrosis uteri). Muench. med. Wchnschr., 1914, LXI, 390.

The author has roentgenized during the past year 18 patients for myomata and 10 for fibrosis uteri, all over 35 years old; all of them were cured until fall, i. e. they became amenorrhoic and the tumors came back; the pressure symptoms were relieved. Longest duration of the treatment, four months. Average of 2-3 series with duration of treatment from four to six weeks. Technic: 3 abdominal fields; in especially severe cases of violent hemorrhage and with a wide vulva, also vaginal irradiation. Tight compression, 20 cm. focus skin distance, 3 mm. aluminum, No. 1 mm. hard rubber, No. 3 to 4 folds of leather. As apparatus Polyphos' universal inductor of Rosenthal, Wehnelt interruptor and Rhytmeur were used. Constant hardness of tubes 20-24 cm. length of spark (30 cm. entire length of inductor): 12-16 ampere, 2-4 milliampere, Holzknecht strips in 15 cm. focus distance measured under the filter show in one sitting 4-7 minutes activity of tubes 0.5-0.6 H. 3-4 sittings on three to four successive days. 3 field serial doses, 4.5 H to 7.2 H, in three series the average dose was therefore 39 H. How much of the hard rays really gets into the depth cannot be determined. There was no "Roentgenkater"; once forgetfulness, excitability, and insomnia in very nervous women, otherwise no disturbance. The advantage of the method is that it is not expensive, it is reliable in its success not to much strain and simple.

Doederlein (at the same meeting) reports a case of carcinoma of the uterus which was roentgenized from July to September, 1913, with large doses (223 hours in 9 sittings). The general condition of the patient improved but the hemorrhages did not stop and the patient was operated on (the first carcinoma operation since February, 1913). A myomatous uterus was irradiated and treated with application of mesothorium but the hemorrhage could not be stopped. The microscopic examination of the specimen showed giant cell sarcoma.

Broca, Aug., & Mahar, V.: Roentgentherapy in local tuberculosis (Die Roentgentherapie bei lokaler Tuberkulose). Strahlentherapie, 1914, IV, 261-271.

The authors give the history of cases of local tuberculosis treated with roentgentherapy at the children's hospital in Paris since 1912. Only the cases which were sufficiently treated and only those of the clinic are reported.

Twenty-six cases of tuberculosis of the teguments were treated with six cures and eight cases considerably improved. Seven cases of fungous synovitis with six perfect cures and one considerable improvement. Of the seventy-nine cases of tuberculosis of the lymphatic glands thirty-six were completely cured, twenty-four considerably improved and nineteen improved. Of the cases of ostitis and osteoarthritis, 21 spina ventosa and localized ostitides, seven were perfectly cured, 11 considerably improved and three had negative results; fourteen cases of tumor albus were cured in five cases, eight were improved and in one case the result was negative.

The technic which was followed was not uniform because the age, the location, the depth and the nature of the lesion and especially the sensitiveness of the teguments and the lesions had to be considered.

In general the results were effected with relatively weak doses at long intervals. Strong and frequent doses were avoided; destruction of the cells was not intended, but especially a stimulation of the not yet necrosed tissues. The authors are convinced that overdosage is the main obstacle in roentgentherapy for local tuberculosis, because it prevents the process of regeneration.

After many experiments they accepted a medium dose as the base of their therapy, resulting from a ten minutes' exposure with 20 cm. cathode distance, Mueller's water-

cooling tube of 5-6 Benoist with 1 to 1.2 milliampere. This dose is understood without filtration.

This dose was sufficient in most cases, and never gave too strong reactions even in individuals who are very sensitive for the rays.

In tuberculosis of the lymph glands the medium dose was increased 1/4 to 1/2, regulating the following doses of later irradiation according to the effect of the first dose.

With few exceptions an interval of from twelve to fourteen days between two irradiations of the same focus were allowed to pass.

For superfacial foci no filters are applied. For non-suppurating tuberculosis of the lymph glands it is advantageous to employ an aluminum filter; if, however, ulcerations and fistula, etc., are present at the same time, it is better to use no filter for the first irradiation, increasing the strength of the filters when compelled to increase the number of irradiations. For tumor albus the cross-fire method should be applied.

The effect of the roentgentherapy may be explained by a double process:

A destructive or abiotic effect upon the lymphatic or other elements which compose the tubercle, which is followed by the decay of the tubercle and the opening of the lymph and blood ducts, which again enables the antitoxins of the organism to reach the zone of the disease and clean it. A stimulating effect upon the sound tissues around the lesion, favoring reparation and healing.

The conclusions of the authors are:

The results are interesting because they were effected in patients of the poorer class of people, where hygiene and nutrition leave much to be desired and who frequently are hereditarily afflicted with tuberculosis or syphilis. In the future much may be expected from roentgentherapy in local tuberculosis; it is without danger, easily applied and painless and brings, in the majority of cases, cure.

If this therapy is employed simultaneously with puncture, with broad incision of the cold abscesses, with curettage of the fungous masses and removal of the bone sequesters, it will be in all severe cases a powerful aid in the surgical treatment.

Schede, Fr.: Roentgen therapy for tuberculosis of the bones and joints (Die Roentgenbehandlung der Knochen- und Gelenktuberkulose). Fortschr. a.d. Geb. d. Roentgenstr., 1913, XXI, 341-351.

Schede discusses the various methods of roentgentherapy in tuberculosis of the bones and joints, and the theories of the different authors. All the methods have in common the supposition that the effect of the different qualities of the rays is quite different, and that the main point is to bring a certain definite dose of rays to absorption on the diseased parts and not as many rays as possible. Iselin, who, according to the writer, has had the greatest practical experience, irradiates in intervals of three weeks with a filter of 1 mm. aluminum through several windows and with a focus distance of 30 cm. the maximal dose, measured under the filter according to Sabouraud is on the wrist, 5 units; on the elbow, 10 units, on the shoulder joint, 8 units; clavicula, 8 units; neck, 8 units; chest and abdomen, 5 to 6 units; knee, 10; and foot at most, 3 units. Roentgenization is contraindicated, according to Iselin, in cases of deep seated foci in the hip and ileosacral joint, tumor albus in adults, foci enclosed in the bone, and ostitis tuberculosa. Iselin's results are good: In 1910 he had treated 41 cases, 24 of which were cured and six improved; 10 were still under treatment, 1 remained unaffected.

Schede roentgenizes in intervals of four weeks, as a rule without filter and from different sides. The maximal dose applied upon one spot was 3-4 Holzknecht; medium rays and a focus distance of 30 cm. He had good results with irradiation of the hip joints even in adults and without filtration. Also ostitis was favorably influenced. The best results were effected in fistulas and tuberculous ulcerations. The tuberculous granulations decay about five days after the roentgenization with profuse secretion. The fistulas become considerably larger, show fresh red granulations and at the same time a new skin begins to form from the borders; after several relapses and irradiations a solid scar is formed.

In nineteen cases of Schede the results were as follows: Cured were 9 cases, 2 coxitis, 2 gonitis, and 5 tuberculosis of the foot; improved were 3 cases, 1 gonitis and 2 tuberculosis of the foot; not cured were 7 cases, 1 tuberculosis of the foot, 2 spondylitis, 3 coxitis and 1 gonitis. All these cases were severe, where surgical and orthopedical treatment was of no effect.

With the small doses there is no danger of disturbance in the growth, and if there is any, it is less than that after surgical resections. The roentgen rays have a favorable effect upon the irradiated focus and upon the whole body.

The most important task is the scientific determination of the effect of the different qualities of rays. Hard and soft rays must be strictly separated, though both may be probably appliable in the individual case.

The roentgen therapy can be applied only in connection with other therapies. It is an established fact that with a skilled combination of therapies the best results are effected in tuberculosis. The fundamental rule for the treatment is improvement of the general condition and a careful orthopedic treatment. The effect of combined orthopedic treatment and roentgenization may be explained in such way that the orthopedic treatment keeps every damaging irritation from the diseased joint and allows a free development of the antitoxins of the body, and that the irradiation stimulates the natural forces, and destroys the damaging products and probably also the bacilli.

An extensive bibliography is given.

Albers-Schoenberg, Prof.: The problem of secondary ray therapy. Abstract by M. C. M., from Fort. a. d. Geb. d. Roentstrhln, Oct. 2, B. XXI, H. 1, 1913.

It is Schoenberg's belief that the main problem of Roentgenology is to utilize for therapeutic purposes the so-called homogeneous secondary rays. Experiments were therefore made to determine what part these rays play in present-day therapy, i. e., whether the results of deep Roentgenotherapy should be attributed exclusively to primary rays, rendered very hard by filtration, or whether secondary rays from the filter have a marked influence upon the results obtained.

The first group of experiments consisted of the Roentgenization of guinea pigs by isolated secondary rays, emanating from a capsule containing aluminum, which was exposed to primary rays filtered through 2 mm. aluminum. Although four times an erythema dose was administered on several occasions upon the aluminum capsule, the histological effect upon the guinea pig of the secondary rays thus obtained, was uniformly negative after an interval of a month. The same results were obtained when these experiments were repeated without the intervening aluminum filter.

Dry plates were then exposed instead of guinea pigs, all direct rays being eliminated as before. The plates showed about the same exposure whether or not the aluminum capsule was interposed. If there was any difference at all, the plates made without the intervening capsule were more exposed, showing that the secondary rays from the surrounding lead were more effective than those from the aluminum capsule.

These experiments seemed to indicate that the secondary rays exerted no histological or photographic influence upon the exposed object.

Various investigators have attempted with apparently some success to supplement the therapeutic effect of primary rays by

the addition of secondary rays given off from metallic substances introduced at the site of deep lesions. For this purpose, Schoenberg has devised aluminum capsules in suitable shapes, which can be easily inserted and withdrawn from the region involved, such as the uterus, ovaries, rectum, etc. After the capsule has been put in place, the exposure proceeds in the usual way. As only a few patients have been treated by this method, and as only a short time for observation has since elapsed, no opinion is offered as to the positive or negative character of the results.

The author suggests that further experiments be undertaken to determine the effect of secondary rays from various metals, since it is presumable that the rays from lead, silver, and iron have characteristics different from those of aluminum and glass.

Schoenberg's experiments seem to throw some light on the hypothesis that the biological effect of mesothorium results not only from the hard gamma rays, but also from the secondary rays originating therein, and also in the surrounding protective capsule. The general opinion at present is that the use of mesothorium will revive confidence in Roentgenotherapy.

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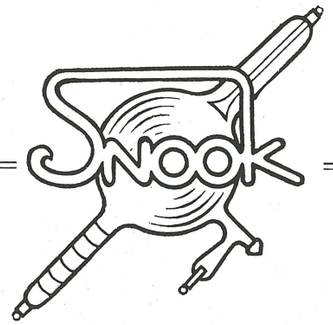
Silk gloves "sized" with lead are being manufactured for the protection of X-ray operators. In the past, the gloves which have been employed have been heavily plated on the backs with lead, but they were unwieldly and failed to protect the palms of the hands. The new fabric is a French product and has been thoroughly tested for arresting the rays which so often seriously injure the operators. It is found that all parts of the hands are protected by them and that they are flexible and much easier to use than the old form of glove.

Medical science had lost several men before the dangers of these terrible rays were fully understood. The pioneers did not suspect that the rays from those particular tubes were any more dangerous than those from any ordinary incandescent lamp, and exposed themselves freely. But now the expert hides behind lead.—*Technical World.*



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